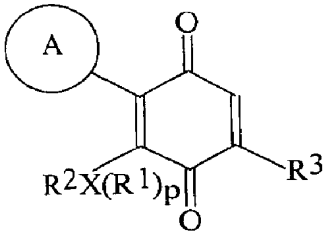
Claims:

1. A method for the treatment of a hyperproliferative disorder, comprising administering to a subject in need of treatment a therapeutically effective amount of a cannabinoic quinone of formula I:

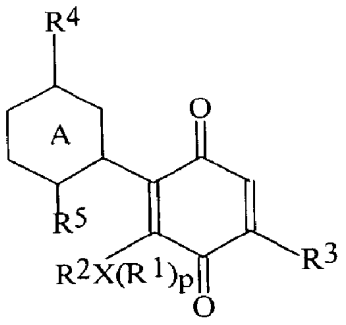


(I)

wherein,

ring A is 5-, 6-, or 7-membered alicyclic or aromatic ring optionally substituted with from 1 to 3 substituents selected independently from optionally branched C_1-C_5 alkyl, optionally branched C_1-C_5 alkenyl, hydroxy, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;
X is an oxygen, nitrogen or sulfur atom;
p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;
R^1 is H or C_1-C_5 alkyl;
R^2 designates a substituent selected from H and C_1-C_5 alkyl, or R^2 designates an optionally branched C_1-C_5 alkylene connected to ring A forming a 6-membered heterocyclic ring comprising atom X, two carbon atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A; and
R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano.

2. The method of claim 2, wherein said cannabinoic quinone is a compound of formula (II):



(II)

wherein,

ring A is a cyclohexane, cyclohexene or benzene ring;

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_5 alkyl;

R^2 designates a substituent selected from H and C_1-C_5 alkyl, or R^2 designates an optionally branched C_1-C_5 alkylene connected to ring A forming a 6-membered heterocyclic ring comprising atom X, two carbon atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A;

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

R^4 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano; and

R^5 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl, or R^5 is hydrogen when R^2 is alkylene.

3. The method of claim 1 or 2, wherein said cannabinoic quinone is any one of HU-331, HU-336, HU-345, HU-395 and HU-396.

4. The method of any one of claims 1 to 3, wherein said hyperproliferative disorder is a malignant or a non-malignant disorder.

5. The method of any one of claims 1 to 3, wherein said hyperproliferative disorder is one of carcinoma, lymphoma, melanoma, glioblastoma and sarcoma.

6. The method of claim 5 , wherein said cannabinoic quinone is one of HU-331, HU-395 and HU-396.

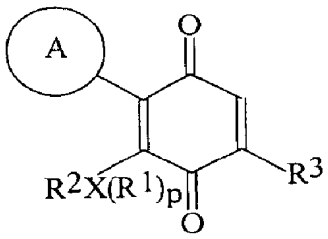
7. The method of claim 6, wherein said hyperproliferative disorder is one of colon cancer, lymphoma and breast cancer.

8. The method of claim 5, wherein said cannabinoic quinone is one of HU-336 and HU-345.

9. The method of claim 8, wherein said hyperproliferative disorder is one of prostate cancer and glioblastoma.

10. The method of any one of claims 1 to 9, wherein said cannabinoic quinone or composition comprising the same is administered via intraperitoneal, subcutaneous or intratumor route.

11. A method for the treatment of one of inflammatory, infectious and auto-immune conditions, comprising administering to a subject in need of such treatment a therapeutically effective amount of a cannabinoic quinone of general formula I :



(I)

wherein,

ring A is 5-, 6-, or 7-membered alicyclic or aromatic ring optionally substituted with from 1 to 3 substituents independently selected from optionally branched C_1-C_5 alkyl, optionally branched C_1-C_5 alkenyl, hydroxy, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

X is an oxygen, nitrogen or sulfur atom;

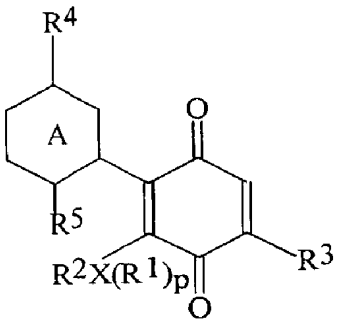
p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_5 alkyl;

R^2 designates a substituent selected from H and C_1-C_5 alkyl, or R^2 designates an optionally branched C_1-C_5 alkylene connected to ring A forming a 6-membered heterocyclic ring comprising atom X, two carbon atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A; and

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano.

12. The method of claim 11, wherein said cannabinoic quinone is a compound of formula (II):



(II)

wherein

ring A is a cyclohexane, cyclohexene or benzene ring;

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_5 alkyl;

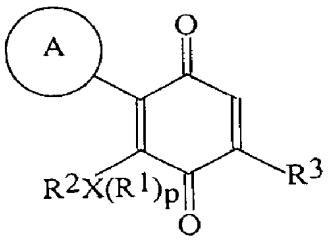
R^2 designates a substituent selected from H and C_1-C_5 alkyl, or R^2 designates an optionally branched C_1-C_5 alkylene connected to ring A forming a 6-membered heterocyclic ring comprising atom X, two carbon atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A;

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

R^4 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano; and

R^5 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl, or R^5 is hydrogen when R^2 is alkylene.

13. Use of a cannabinoic quinone of formula I:



(I)

wherein,

ring A is 5-, 6-, or 7-membered alicyclic or aromatic ring optionally substituted with from 1 to 3 substituents independently selected from optionally branched C_1-C_5 alkyl, optionally branched C_1-C_5 alkenyl, hydroxy, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_5 alkyl;

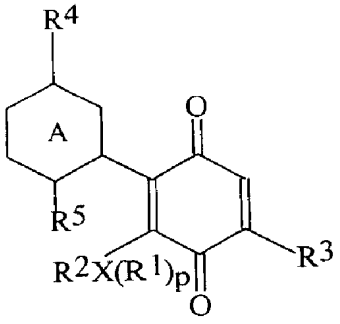
R^2 designates a substituent selected from H and C_1-C_5 alkyl, or R^2 designates an optionally branched C_1-C_5 alkylene connected to ring A forming a 6-membered heterocyclic ring comprising atom X, two carbon atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A; and

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

or any optically active isomer or racemic mixture of said cannabinoic quinone;

in the preparation of a medicament for treating a disease or condition selected from the group consisting of hyperproliferative disorders, inflammation, infections caused by bacteria, protozoa or fungus, and autoimmune diseases.

14. The use of claim 13 wherein said cannabinoic quinone is a compound of formula (II):



(II)

wherein

ring A is a cyclohexane, cyclohexene or benzene ring;

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_5 alkyl;

R^2 designates a substituent selected from H and C_1-C_5 alkyl, or R^2 designates an optionally branched C_1-C_5 alkylene connected to ring A forming a 6-membered heterocyclic ring comprising atom X, two carbon atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A;

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

R^4 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano; and

R^5 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl, or R^5 is hydrogen when R^2 is alkylene.

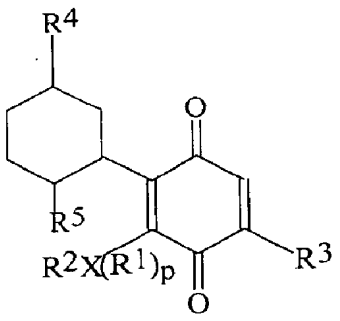
15. The use of claim 13 or 14, wherein said cannabinoic quinone is selected from HU-331, HU-336, HU-345, HU-395 and HU-396.

16. The use of claim 15, wherein said cannabinoic quinone is HU-331.

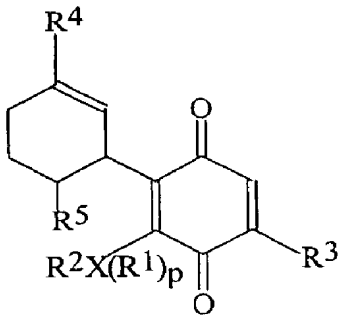
17. The use of claim 13 , wherein said hyperproliferative disorder is one of carcinoma, lymphoma, melanoma, glioblastoma, sarcoma and psoriasis.

18. The use of claim 17, wherein said hyperproliferative disorder is colon cancer or lymphoma.

19. A compound of formula (III) or (IV):



(III)



(IV)

wherein

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_5 alkyl;

R^2 designates a substituent selected from H and C_1-C_5 alkyl;

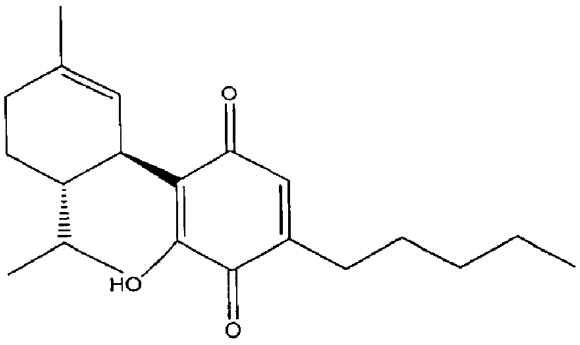
R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano; and

R^4 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano; and

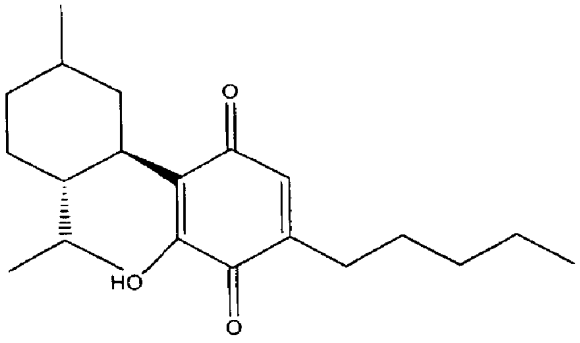
R^5 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl;

with the proviso that said compound is not 3S,4R-p-benzoquinone-3-hydroxy-2-p-mentha-(1,8)-dien-3-yl-5-pentyl.

20. The compound of claim 19, wherein said compound has one of the formulae:

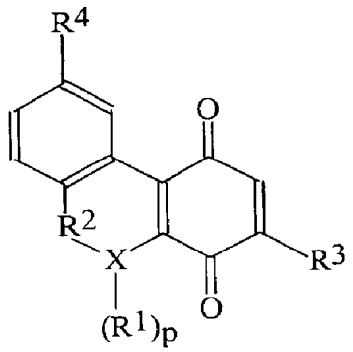


designated HU-395; or



designated HU-396.

21. A compound of formula (V):



(V)

wherein

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_5 alkyl;

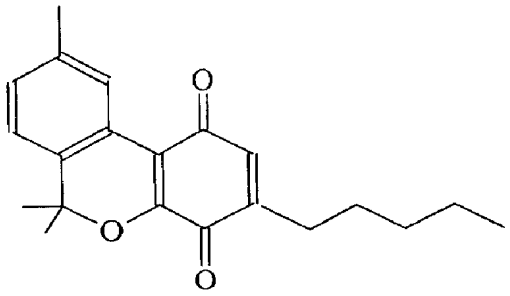
R^2 designates a methylene group optionally substituted with up to two alkyl groups, wherein R^2 with the substituents comprises up to 5 carbon atoms;

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano; and

R^4 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano;

with the proviso that the compound is not 6aR,10aR-1-H-dibenzo[b,d]pyran-1,4-(6H)-dione-6aβ,7,10,10aα-tetrahydro-6,6,9-trimethyl-3-pentyl.

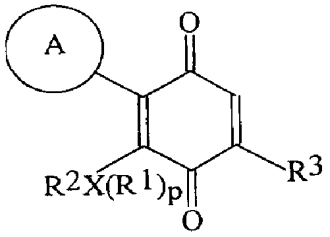
22. The compound of claim 21, wherein said compound has the formula:



and is designated HU-345.

23. The optically active isomer and the racemic mixture of each of the compounds defined in claims 19 to 22 .

24. A pharmaceutical composition comprising as active agent a cannabinoic quinone or an enantiomer thereof, wherein said cannabinoic quinone is a compound of the general formula (I):



(I)

wherein,

ring A is 5-, 6-, or 7-membered alicyclic or aromatic ring optionally substituted with from 1 to 3 substituents independently selected from optionally branched C_1-C_5 alkyl, optionally branched C_1-C_5 alkenyl, hydroxy, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino and cyano;

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_5 alkyl;

R^2 designates a substituent selected from H and C_1-C_5 alkyl, or R^2 designates an optionally branched C_1-C_5 alkylene connected to ring A

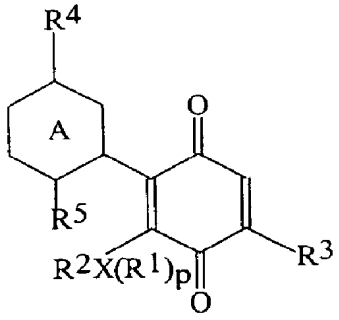
forming a 6-membered heterocyclic ring comprising atom X, two carbon atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A;

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

with the proviso that said compound of formula (I) is not 3S,4R-p-benzoquinone-3-hydroxy-2-p-mentha-(1,8)-dien-3-yl-5-pentyl or 6aR,10aR-1-H-Dibenzo[b,d]pyran-1,4-(6H)-dione-6aβ,7,10,10aα-tetrahydro-6,6,9-trimethyl-3-pentyl;

and optionally further comprising at least one pharmaceutically acceptable additive, diluent and/or carrier;

25. The pharmaceutical composition of claim 24, wherein said cannabinoic quinone is the compound of formula (II):



(II)

wherein

ring A is a cyclohexane, cyclohexene or benzene ring;

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_5 alkyl;

R^2 designates a substituent selected from H and C_1-C_5 alkyl, or R^2 designates an optionally branched C_1-C_5 alkylene connected to ring A forming a 6-membered heterocyclic ring comprising atom X, two carbon

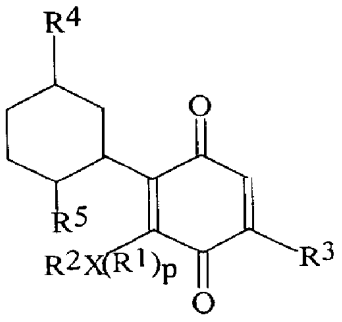
atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A;

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

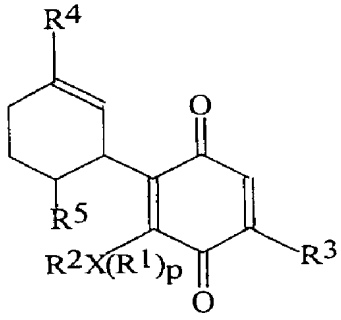
R^4 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano; and

R^5 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl, or R^5 is hydrogen when R^2 is alkylene.

26. The pharmaceutical composition of any one of claims 24 and 25, wherein said cannabinoic quinone is a compound of one of formulae (III) or (IV), wherein formulae (III) and (IV) have the structure:



(III)



(IV)

wherein

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_5 alkyl;

R^2 designates a substituent selected from H and C_1-C_5 alkyl;

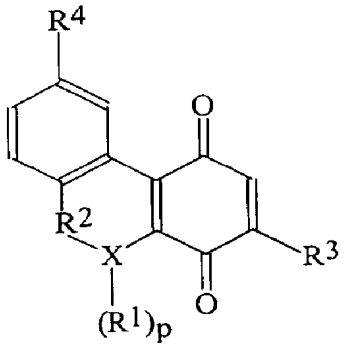
R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with

hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano; and

R^4 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano; and

R^5 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl.

27. The pharmaceutical composition of any one of claims 24 and 25, wherein said cannabinoic quinone is a compound of formula (V):



(V)

wherein

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_5 alkyl;

R^2 designates a methylene group optionally substituted with up to two alkyl groups, wherein R^2 with the substituents comprises up to 5 carbon atoms;

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano; and

R^4 is optionally branched C_1-C_5 alkyl or optionally branched C_1-C_5 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano.

28. The pharmaceutical composition of any one of claims 24 to 26, wherein X is oxygen, R^2 is hydrogen, and R^5 is 2-propyl or 2-propenyl.

29. The pharmaceutical composition of any one of claims 24, 25 and 27, wherein X is an oxygen atom forming a pyrane ring comprising two carbon atoms of the quinone ring to which said oxygen is attached and carbon atoms 3 and 4 of ring A, which pyrane ring is preferably 2,2-dimethyl substituted.

30. The pharmaceutical composition of any one of claims 24 to 27, wherein R^4 is methyl.

31. The pharmaceutical composition of claim 24, wherein said cannabinoic quinone is the compound 1-H-dibenzo[b,d]pyran-1,4(6H)-dione-6,6,9-trimethyl-3-pentyl (also designated HU-345).

32. The pharmaceutical composition of claim 24, wherein said cannabinoic quinone is the compound 3S,4R-p-benzoquinone-3-hydroxy-2-[p-mentha-1-en-3-yl]-5-pentyl (also designated HU-395).

33. The pharmaceutical composition of claim 24, wherein said cannabinoic quinone is the compound 3S,4R-p-benzoquinone-3-hydroxy-2-[p-menthan-3-yl]-5-pentyl (also designated HU-396).

34. The pharmaceutical composition of any one of the preceding claims, for the treatment of hyperproliferative disorders.

35. The pharmaceutical composition of claim 34, wherein said hyperproliferative disorder is a malignant or a non-malignant disorder.

36. The pharmaceutical composition of claim 34, wherein said hyperproliferative disorder is one of carcinoma, lymphoma, melanoma, glioblastoma and sarcoma.

37. The pharmaceutical composition of claim 35, wherein said non-malignant hyperproliferative disorder is psoriasis.

38. The pharmaceutical composition of any one of the preceding claims, for intra-peritoneal (i.p.), subcutaneous (s.c.) or intratumor administration.

39. The pharmaceutical composition of any one of claims 24 to 33, for the treatment of a disease or condition selected from inflammation and infections caused by bacteria, protozoa or fungus.

40. The pharmaceutical composition of any one of claims 24 to 33, for the treatment of an autoimmune disease.

41. The pharmaceutical composition of claim 24, wherein said carrier is a 1:1:18 (v/v) mixture of ethanol:Emulphor®:PBS.

42. The pharmaceutical composition of any one of the preceding claims, wherein said active agent comprises an optically active isomer or a racemic mixture of said cannabinoic quinone.

43. A pharmaceutical composition comprising as active agent a cannabinoic quinone, or an enantiomer thereof, selected from HU-345, HU-395, and HU-396.